ABSTRACT

A class of soft-input soft-output demodulation schemes for multiple-input multiple-output (MIMO) channels, based on the sequential Monte Carlo (SMC) framework under both stochastic and deterministic settings. The stochastic SMC sampler generates MIMO symbol samples based on importance sampling and resampling techniques, while the deterministic SMC approach recursively performs exploration and selection steps in a greedy manner. By exploiting the artificial sequential structure of the existing simple Bell Labs Layered Space Time (BLAST) detection method based on nulling and cancellation, the proposed algorithms achieve an error probability performance that is orders of magnitude better than the traditional BLAST detection schemes while maintaining a low computational complexity. Performance is comparable with that of the sphere decoding algorithm, with a much lower complexity. Both the stochastic and deterministic SMC detectors can be employed as the first-stage demodulator in an iterative or turbo receiver in coded MIMO systems.